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W. A. BREEDON ET AL

2,233,580

INNER COVER FOR ANNEALING FURNACES

Filed Jan. 16, 1940

3 Sheets-Sheet 1

FIG. 1.

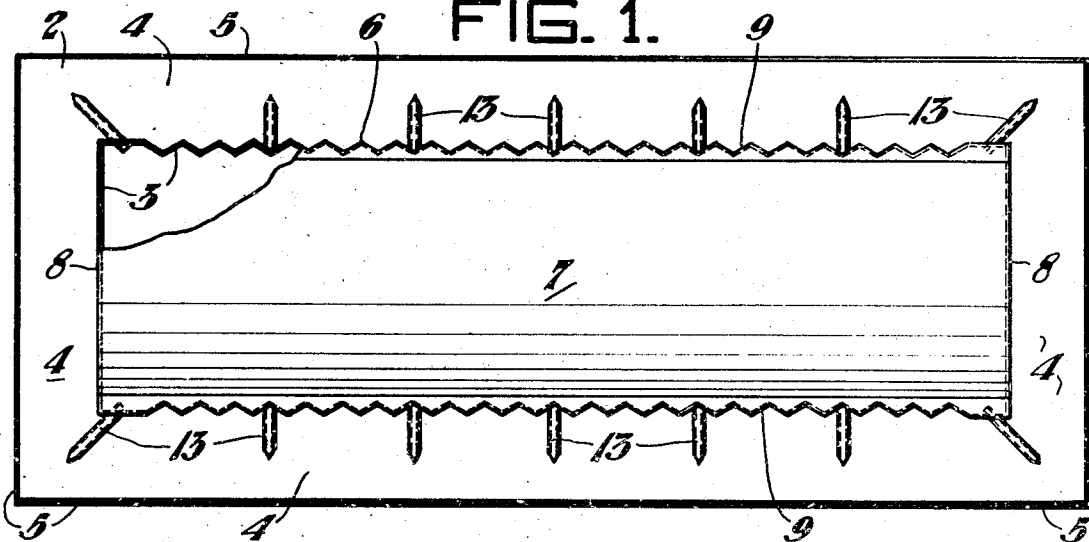
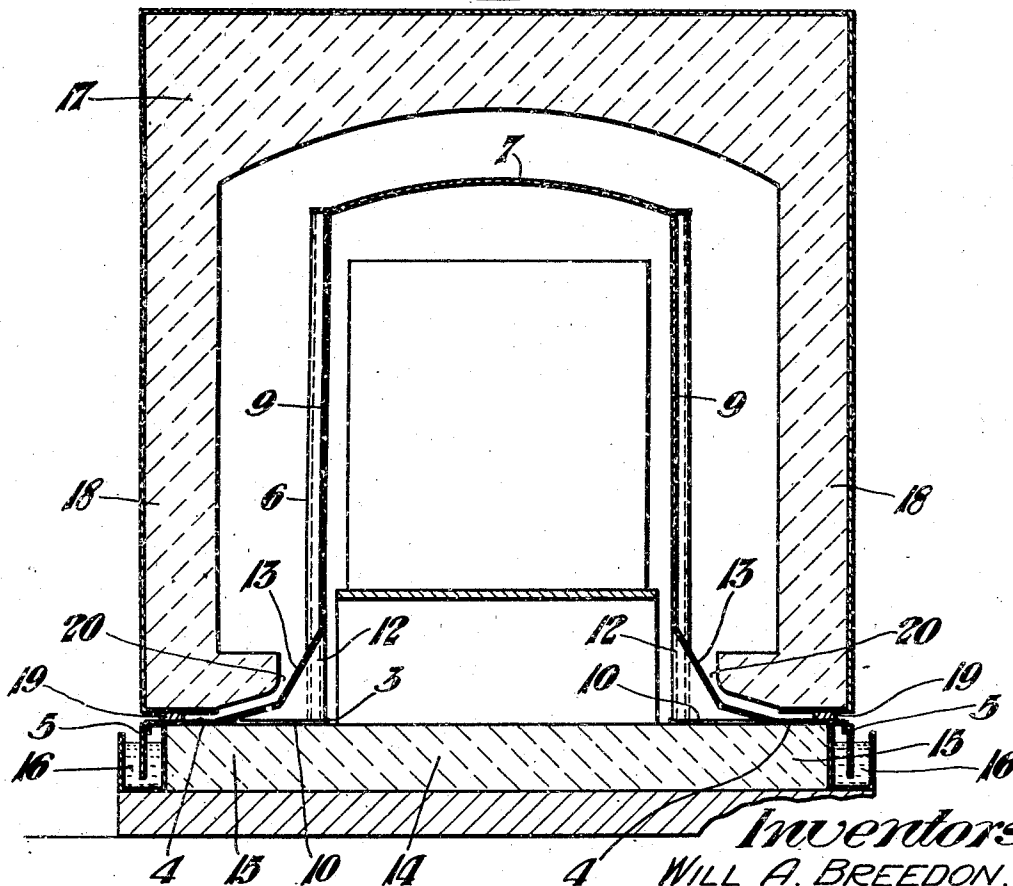


FIG. 2.



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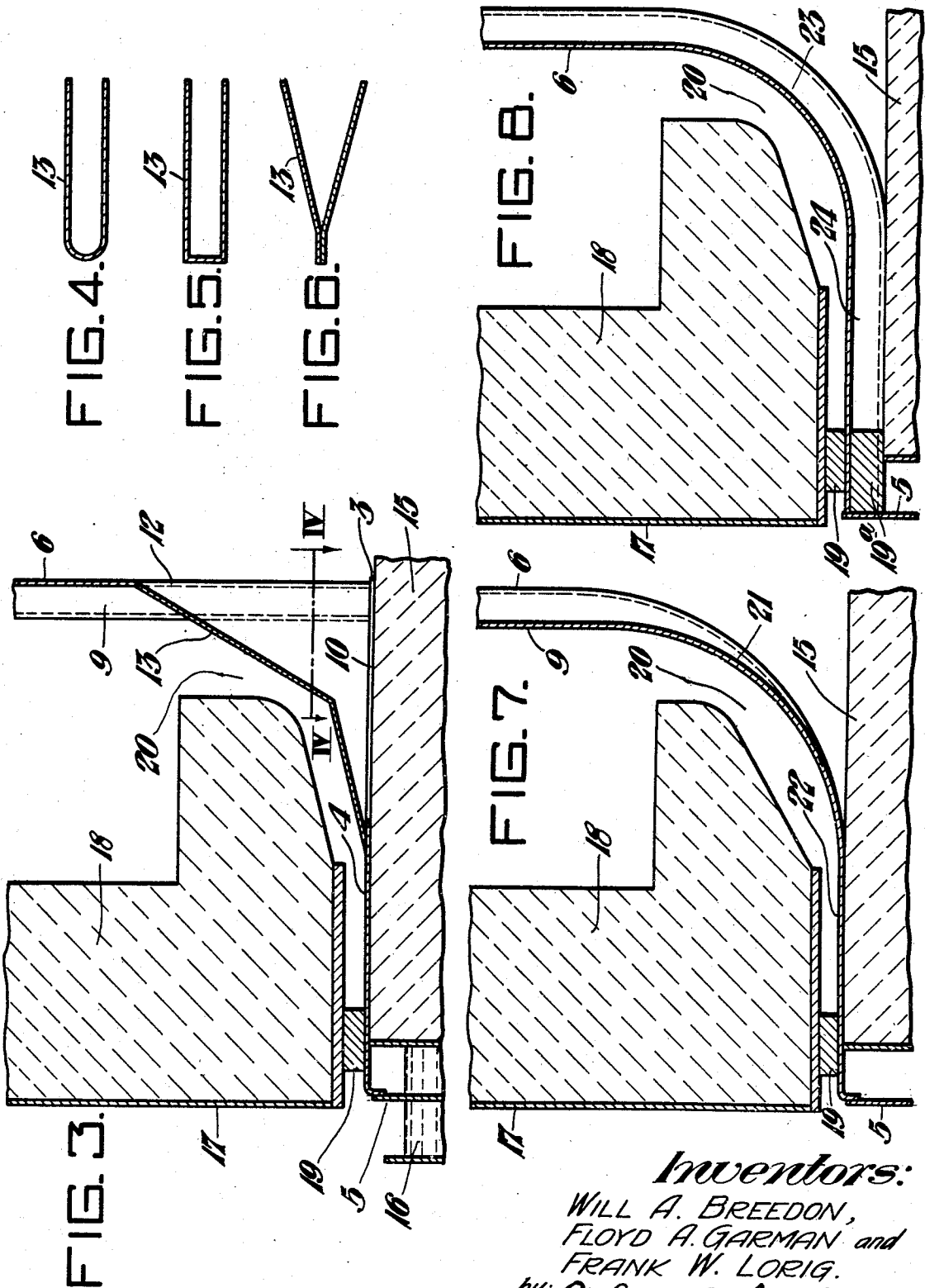
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3 Sheets-Sheet 2



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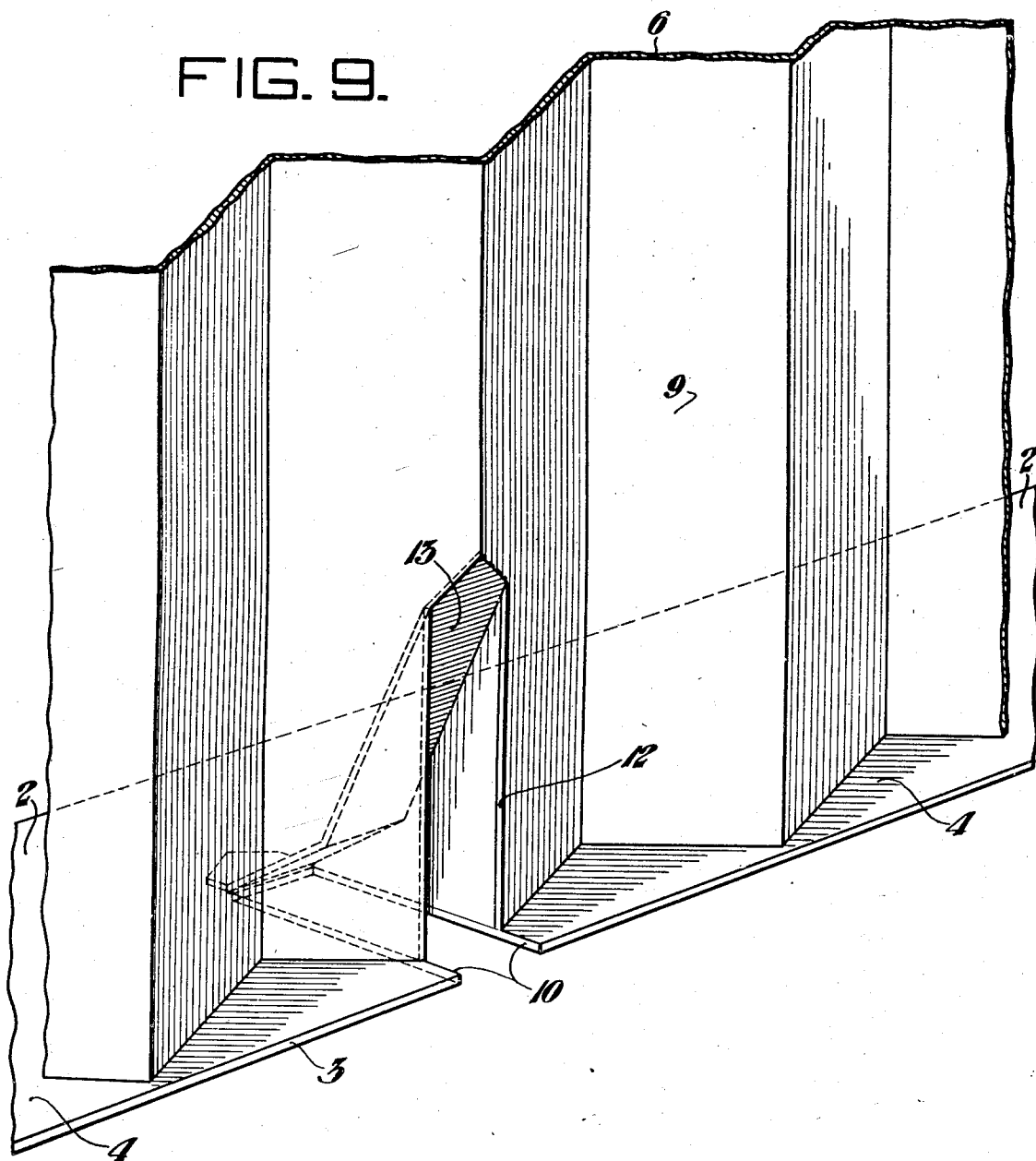
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3 Sheets-Sheet 3

FIG. 9.



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UNITED STATES PATENT OFFICE

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INNER COVER FOR ANNEALING FURNACES

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Application January 16, 1940, Serial No. 314,154

1 Claim. (Cl. 263—49)

This invention relates to inner or annealing covers as used for enclosing articles in annealing furnaces, and particularly to an improved inner or annealing cover for use therewith.

It is now the general practice in annealing steel articles, as is well known to those skilled in the art, to enclose them in an inner or annealing cover in the annealing furnace to protect the surface of the articles being annealed from oxidation or decarbonization and to protect the same directly from the intense heat therein, thereby obtaining a more uniform heating of the object or articles. Sometimes it is desirable to anneal the object or articles in a reducing atmosphere or otherwise suitably prepared atmosphere so as to prevent oxidation.

Various types of inner annealing covers or boxes have been suggested and used but it has been found by experience that most of these covers become warped and very much distorted after a short period of use.

It is the usual practice in heating objects or articles in a reducing or otherwise suitably prepared atmosphere, to confine such atmosphere within the airtight cover and seal the bottom edges thereof by disposing the same either in a liquid, sand, or other suitable sealing medium. It will be seen that such inner annealing covers are subjected to a wide variation of temperatures within the furnace, thereby producing different elongations of the metal from which it is made which results in the warping and buckling thereof. Therefore, it is desirable that means be provided to compensate for the different elongations to which the metal is subjected so as to prevent this undue distortion of such covers and it is to this that the present invention refers.

Accordingly, it is one of the objects of the present invention to provide an improved inner or annealing cover which is so constructed that it compensates for the different elongations and contractions of the portions of the cover, thereby preventing the distortion thereof.

It is another object of the invention to provide an improved inner or annealing cover which is simple and inexpensive in its construction, and yet one which is strong and rugged and very effective in its use.

Various other objects and advantages of this invention will become more apparent in the course of the following specification and will be particularly pointed out in the appended claim.

In the accompanying drawings, there is shown, for the purpose of illustration and description,

an embodiment and several modifications thereof which our invention may assume in practice.

In these drawings:

Figure 1 is a plan of the improved inner cover of our invention;

Figure 2 is a cross sectional view through an annealing cover type furnace showing the inner cover of our invention incorporated therewith;

Figure 3 is an enlarged cross sectional view similar to Figure 2 through one side of the annealing furnace as shown therein;

Figure 4 is a sectional view taken on line IV—IV of Figure 3;

Figures 5 and 6 are views similar to Figure 4 showing modified forms of expansion members which may be used in connection with the inner cover of the present invention;

Figure 7 is a view similar to Figure 3 showing a modified construction of the inner cover of our invention;

Figure 8 is also a view similar to Figure 3 showing still another modified construction of our improved inner cover; and

Figure 9 is a fragmentary isometric view of the inner lower portion of the improved inner cover of our invention, showing one of the expansible members welded in place.

Referring more particularly to the drawings, there is shown in Figure 1, an inner or annealing cover consisting of a rectangularly shaped base plate 2 having a rectangularly shaped opening 3 arranged centrally thereof so as to provide apron-like portions 4 therearound. There is arranged around the outer edges of the base-like plate member 2 a downwardly extending sealing member 5 which may be welded to the edge of the base plate or made an integral part thereof, whichever is desired, and adapted for a purpose to be described hereinafter. There is superimposed upon the base plate 2 enclosing the opening 3 therein an open-bottomed box-like light-weight metallic body member 6 having a top portion 7, end walls 8 and side walls 9. The bottom edges of the end walls 8 and the side walls 9 are attached to the base plate 2 adjacent the edges of the opening 3 therein, preferably by means of welding. The side walls 9, as shown, are corrugated but it will be understood that these side walls may be straight, similar to the end walls 8.

According to the present invention, there is arranged in the base plate 2 around the opening 3 therein and the box-like body member 6, a plurality of horizontally disposed slotted openings 10 which are arranged at spaced apart intervals

with each of the slots extending from the edge of the opening in the plate outwardly to a point intermediate the apron-like portions 4. There is also arranged in the side walls 9 of the box-like body member 6 a corresponding number of similarly positioned vertically extending slotted openings 12 which are arranged at spaced apart intervals directly opposite the slotted openings 10 in the base plate 2 with each of the slotted openings 12 extending from the bottom edge of the side walls 9 to a point intermediate the height thereof.

There is superimposed over each set of slotted openings 10 and 12, that is, over both the slot 10 in the base plate 2 and the slot 12 in the side walls 9, as is more clearly shown in Figure 9 of the drawings an irregularly shaped web or flange-like member 13, preferably having substantially a U-shaped cross section with the free edges thereof securely welded to the opposed edges of the slotted openings 10 formed in the base plate 2 and the slotted openings 12 formed in the side walls 9, thereby providing an airtight expansible joint therebetween. That is to say, the lower edges of the side walls 9 of the body member 6 and the inner edges of the apron-like portions 4 of the base plate 2 are similarly cutaway at spaced apart intervals around the cover with a flange-like member 13 disposed over each of the cutaway portions and welded in place over such openings formed by the cutaway portions so as to prevent the heat from escaping from inside the inner cover and to permit expansion of the lower edges of the side walls 9, together with the inner edges of the apron-like portions 4 of the base plate. It is preferable that the flange-like members 13 be angularly shaped as shown in Figure 3, but it will be understood that these members may be of arcuate shape or any other suitable shape. Also, it is preferable that the flange-like members 13 have substantially a U-shaped cross section as shown in Figures 4 and 5 of the drawings, or they may be of any other suitable expansible cross section, such as V-shaped as shown in Figure 6. Thus, by providing such a construction, it will be seen that the lower inner edges of the side walls 9 of the body member 6 and the edges of the apron-like portions 4 around the opening 3 in the base plate 2 will be permitted to expand and contract similar to the action of an accordion during the heating and cooling thereof, thereby eliminating any tendency of the cover to distort or buckle.

Such an inner or annealing cover is adapted to be used with a furnace such as shown in Figure 2 of the drawings. This type of furnace has a base or hearth 14 on which the articles or object to be heat treated are placed and a shoulder portion 15 therearound on which the base plate 2 of the inner cover is adapted to set. There is arranged around the outer edge of the base 14 and the shoulder portion 15 thereof a moat-like channel 16 in which there is disposed a liquid, sand, or other suitable sealing medium, in which the downwardly extending sealing members 5 of the inner cover are adapted to be positioned to seal the same from the atmosphere and to confine the reducing atmosphere therein. There is placed over the inner or annealing cover a conventional type outer or heating cover 17 having downwardly extending side walls 18 which are adapted to rest preferably on blocks 19 disposed on top of the apron portion 4 of the base plate 2.

It will be seen that during the heat treating of

the articles in the furnace, the inner edges of the apron-like portion 4 of the base plate 2 are subjected to a much greater temperature than the outer edges thereof and that the upper portions of the side walls 9 are subjected to a greater temperature than the bottom edges thereof, which, of course, results in a material elongation of the upper portions of the side walls 9 while the outer edges of the apron-like portions 4 of the base plate 2 are subjected to little or no elongation during the annealing operation. Thus, the difference in elongation of these portions of the cover during heating will be compensated for by the expansion members 13. It will also be seen that the shape of the expansion member 13 compensates for the difference in elongation or contraction of the inner edges of the apron-like portion 4 of the base plate 2 and the lower edges of the side walls 9 of the cover which are disposed in a zone of variable temperatures as shown at 20 in Figure 3 of the drawings. In annealing covers as formerly constructed, the bottom edges of the side walls would buckle and tear away from the base plate, resulting in the escape of the prepared atmosphere from within the cover or permitting outside air to enter thereinto and dilute the prepared atmosphere, thereby causing an increased cost of production or completely defeating the purpose of the annealing covers. It will be seen that this trouble has been entirely eliminated in the cover of the present invention by providing spaced apart expansion joints therealong which automatically expand and contract to compensate for the expansion and contraction of the bottom edges of the side walls and the inner edges of the base plate.

In Figure 7 there is shown a slight modification of the compensating expansible means of the present invention. In this construction the side walls 9 are necessarily corrugated with the bottom edges thereof flared outwardly and terminating in corrugated arcuate shaped fillet-like portions 21 which, in turn, terminate in flat horizontal apron-like portions 22. It will be seen that, likewise in this construction, the difference in elongation between the side walls 9 and the apron-like portions 22 will be compensated for by the expansible corrugated arcuate shaped fillet-like portions 21.

There is shown in Figure 8 of the drawings another modification of the present invention. In this construction the side walls 9 of the inner cover are again corrugated with the corrugated side walls flared outwardly at the bottom thereof so as to provide corrugated arcuate shaped fillet-like portions 23 which terminate in corrugated apron-like horizontal portions 24. Thus, it will also be seen in this construction that the difference in elongation between the side walls 9 of the inner cover and the apron-like portions 24 will be compensated for by the corrugated arcuate-shaped fillet-like portions 23. In the latter construction, there is preferably disposed in the corrugations below the blocks 19 adjacent the outer edges of the apron-like portions 24 and thereunder supporting blocks 19* which are adapted to aid in supporting the outer annealing cover.

As a result of our invention, it will be seen that there is provided an inner or annealing cover for use with annealing furnaces which can be used indefinitely without distortion due to the fact that the differences in elongation of the different portions thereof have been compensated for by its design and construction, thereby tending to

prevent the welded joints thereof from breaking.

While we have shown and described an embodiment and several modifications of our invention, it will be understood that these embodiments are merely for the purpose of illustration and description and that various other forms may be devised within the scope of the invention, as defined in the appended claim.

We claim:

- 10 An inner cover for use in enclosing articles in an annealing furnace comprising a metallic base plate having substantially a rectangular opening centrally arranged therein so as to provide an apron-like portion therearound, an open-bot-
- 15 tomed light-weight substantially rectangular shaped hood superimposed on said base plate over said opening therein having its lower edges securely welded to the inner edges of the rectangular opening in said base plate, said hood hav-
- 20 ing end walls, a top wall and continuously corrugated side walls, said base plate having a plurality of slots arranged therein at spaced apart intervals along the sides of said hood extending from the inner edges of the rectangular opening
- 25 therein outwardly to a point intermediate the

width of the apron-like side portions thereof with the corrugated side walls of said hood having a corresponding number of slots arranged therein between the corrugations directly opposite from those in the base plate with each of these slots extending upwardly from the bottom edge of the hood to a point intermediate the height of the side walls thereof, and an expansible web member having substantially a U-shaped cross section disposed over each of both the slots in the apron-like portions of the base plate and said side wall of the hood with the edges of the web member securely welded to the edges of both the slots in the base plate and the slot in the side wall of the hood thereby enclosing both of said slots by a common means so as to provide an expansible inner joined edge between the base plate and the hood, thus permitting the inner part of the apron-like portions and the side walls of the hood to freely expand and contract relative to the outer part of the apron-like portions without distortion of the cover.

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